**Topics: Normal distribution, Functions of Random Variables**

1. The time required for servicing transmissions is normally distributed with *μ* = 45 minutes and *σ* = 8 minutes. The service manager plans to have work begin on the transmission of a customer’s car 10 minutes after the car is dropped off and the customer is told that the car will be ready within 1 hour from drop-off. What is the probability that the service manager cannot meet his commitment?
2. 0.3875
3. 0.2676
4. 0.5
5. 0.6987

ANS = 0.2676 approx.

1. The current age (in years) of 400 clerical employees at an insurance claims processing center is normally distributed with mean *μ* = 38 and Standard deviation *σ* =6. For each statement below, please specify True/False. If false, briefly explain why.
2. More employees at the processing center are older than 44 than between 38 and 44.=P(X>44)

*# p(X>44); Employees older than 44 yrs of age*

1**-**stats**.**norm**.**cdf(44,loc**=**38,scale**=**6)

=0.15865525393145707

*# p(38<X<44); Employees between 38 to 44 yrs of age*

stats**.**norm**.**cdf(44,38,6)**-**stats**.**norm**.**cdf(38,38,6)

=0.3413447460685429

1. A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.

*# P(X<30); Employees under 30 yrs of age*

stats**.**norm**.**cdf(30,38,6)

=0.09121121972586788

*# No. of employees attending training program from 400 nos. is N\*P(X<30)*

400**\***stats**.**norm**.**cdf(30,38,6)

=36.484487890347154

1. If *X1* ~ *N*(μ, σ2) and *X*2 ~ *N*(μ, σ2) are *iid* normal random variables, then what is the difference between 2 *X*1 and *X*1 + *X*2? Discuss both their distributions and parameters.

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1. Let X ~ N(100, 20^2). Find two values, a and b, symmetric about the mean, such that the probability of the random variable taking a value between them is 0.99.

**from** scipy **import** stats

**from** scipy.stats **import** norm

stats**.**norm**.**interval(0.99,100,20)

(48.48341392902199, 151.516586070978)

1. Let X ~ N(100, 202). Find two values, *a* and *b*, symmetric about the mean, such that the probability of the random variable taking a value between them is 0.99.
2. 90.5, 105.9
3. 80.2, 119.8
4. 22, 78
5. 48.5, 151.5
6. 90.1, 109.9
7. Consider a company that has two different divisions. The annual profits from the two divisions are independent and have distributions Profit1 ~ N(5, 32) and Profit2 ~ N(7, 42) respectively. Both the profits are in $ Million. Answer the following questions about the total profit of the company in Rupees. Assume that $1 = Rs. 45
8. Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.
9. Specify the 5th percentile of profit (in Rupees) for the company
10. Which of the two divisions has a larger probability of making a loss in a given year?